

**Remarks**

Please consider the following Remarks.

Claims 1-32 are currently pending in the application.

The Examiner is respectfully asked to reconsider and withdraw the rejection of claims 1-32 under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. 6,140,547) alone or in view of Sherman (U.S. 5,406,018).

Lin discloses an isomerization process using a catalyst “comprising platinum and a support material such as alumina” and using “an isomerization feed stream additive so as to alleviate or diminish the deactivation of such catalyst” (*see* Lin, column 1, lines 62-67 and column 2, lines 1-2). The additive comprises “at least one added metal halide compound” such as aluminum chloride (*see* Lin, column 2, lines 52-55).

The Examiner has “acknowledged that the Lin reference is silent about the use of an ‘organic’ aluminum halide” (*see* Office Action page 3, second paragraph).

Sherman discloses an isomerization process using a catalyst composition comprising “a metal halide type Lewis Acid and a protic Bronsted Acid” (*see* Sherman column 4, lines 65-67 and column 5, lines 29-32). “The Lewis Acid-hydrocarbon complex catalyst is the product of reaction of at least (a) a Lewis Acid of the formula  $R_{(m-2-z)}(MX_{2+x})$  wherein M is a Group IIIA, VA, or VB metal, X is a halide, R is a hydrocarbyl radical having 1-12 carbon atoms, “m” is an integer equal to the greatest oxidation state of M, and “z” is an integer of 0,1 or m-2; (b) a hydrogen halide; and (c) an organic compound selected from (1) paraffins having 12 or fewer

carbon atoms (2) olefins having 12 or fewer carbon atoms or (3) ethers having 6 or fewer total carbon atoms.” The Lewis Acid can be an aluminum trihalide or an alkylaluminum dihalide (*see* Sherman column 10, lines 7-17 and lines 21-22).

With respect to the Lin reference, the Examiner states “the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made, since the reactant necessary for the formation of organic aluminum halide and the postulated reaction thereof as stated above, would sufficiently suggest to the artisan the utility of the reaction product, *i.e.*, the organic aluminum halides as suitable deactivation retardants. Given such suggested reaction mechanism, the selection of the combination of the reactants in-situ or ex-situ would not impart patentable distinction to an otherwise obvious process.” (*see* Final Office Action page 3, third full paragraph).

Lin states, “while not wishing to be bound by any particular theory, one reaction mechanism that is believed to be occurring in the inventive process which helps to prevent the deactivation of the catalyst is that high molecular weight hydrocarbons, such as C<sub>5</sub> - C<sub>8</sub> hydrocarbons, carbon and/or coke react with the free metal chloride, such as free aluminum chloride, present in additive instead of forming and accumulating within the pores of the catalyst, particularly at the reaction sites within the catalyst.” (*see* Lin, column 7, lines 35-44).

According to the Lin reference, “high molecular weight hydrocarbons, such as C<sub>5</sub> to C<sub>8</sub> hydrocarbons . . . react with a free metal chloride, such as free aluminum chloride present in the additive instead of forming and accumulating within the pores of the catalyst . . . .” (*see* Lin, column 7, lines 37-44). Therefore, the

purpose the additive serves is to prevent heavier hydrocarbons from accumulating within the pores of the catalyst, which would therefore deactivate the catalyst. A good substance that would prevent catalyst deactivation would be an additive that would react with these particular heavier hydrocarbons. The mere fact that an organic aluminum halide may be formed in-situ does not suggest to one skilled in the art the utility of an organic aluminum halide as a deactivation retardant. If the additive has served its purpose, and has formed an organic aluminum halide in the process of doing so, one would not be led to use an organic aluminum halide as the additive itself. In Lin, the organic aluminum halide is formed because of the inorganic aluminum halide serving its purpose, it does not actually serve the purpose on its own. The instant application discloses using an organic aluminum halide additive to the hydrocarbon feed, and to be useful for preventing catalyst deactivation, the additive would have to somehow react with heavier hydrocarbons that may work to deactivate the catalyst.

As for the Sherman reference, Applicants submit that there is no motivation to combine it with the Lin reference. Sherman discloses a catalyst containing Lewis Acid and a Bronsted Acid. Sherman states, "the Bronsted Acid is an integral part of the discrete catalyst species . . ." (*see* Sherman column 12, lines 8-9). Therefore, the Bronsted Acid is an essential part of the isomerization catalyst. In Lin, the catalyst comprises platinum and a support material. The two catalysts are completely different. The metal halide in Lin is actually an additive to the feed. The Lewis Acid hydrocarbon complex catalyst of the Sherman reference is actually the

product of the reaction of a Lewis Acid, the Bronsted Acid, and organic compound.

There is no Bronsted Acid either in the catalyst or additive of the Lin reference.

The Examiner states that it would have been obvious “to replace an inorganic aluminum halide with an organic one since Sherman teaches the substitutability thereof as a Lewis acid source” (*see* Final Office Action, page 4, paragraph 1).

In the Sherman reference, the organic aluminum halide is used as part of a catalyst, which also contains a Bronsted acid. Just because both inorganic and organic aluminum halides can be used in the Sherman catalyst, does not mean that it is obvious to replace the inorganic additive in Lin with an organic one. Both the inorganic and organic aluminum compounds in the Sherman reference are used for a different purpose than that in the Lin reference and in the instant application.

### **Response to Examiner's Response to Arguments**

Applicants once again maintain that the Sherman catalyst calls for a Bronsted acid as an integral part of the catalyst. In Lin, the catalyst comprises platinum and a support material. Applicants maintain that the two catalysts are completely different. In Lin, a Bronsted acid can possibly be present, but usually as a result of hydrogen reacting with an organic chloride compound present in the feed (*see* Lin, col. 6, lines 47-51). The mere presence of a Bronsted acid in this manner in Lin does not suggest to one skilled in the art that an organic compound useful in the Sherman reference can be substituted for the inorganic compound present in the Lin additive. The additive in Lin is used for a different purpose than both the catalyst in Sherman and the catalyst in Lin. The purpose of the additive is to inhibit catalyst deactivation. Using an organic compound makes the additive easier to inject into the hydrocarbon feedstream. Combining the Sherman reference with Lin does not make this aspect obvious.

In view of the foregoing remarks, claims 1-32 are believed to be in condition for allowance. Therefore, early allowance of claims 1-32 is respectfully requested.

Respectfully submitted,

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